

# NCHRP 350 BARRIER RAIL TRANSITION STANDARDS REVISIONS

## BAS Standards

In general, existing standards were revised for 8" x 4" curb. New standards for the barrier rail transition on the approach slab were created from the revised standards. New detail sheets were added for barrier rail transition. In addition to the changes listed below, the standards were also renamed and reordered.

### *BAS1(SM): Bridge Approach Slab for Rigid Pavement*

- Added "Sheet 1 of 2" above title box.
- Added bar designations on Section Thru Slab (A1, A2, B1, B2).
- Section Thru Slab view from old BAS1(SM) for non-reinforced bridge approach fill was moved below the section view for reinforced bridge approach fill. Added direction to substitute 2<sup>nd</sup> note with subdrain note when not using reinforced bridge approach fills.
- Revised Section L-L for 8" x 4" curb without reinforcing steel and construction joint.
- Deleted Section M-M.
- Revised transition length to 3'-1½" (953mm) for Detail at End of Curb without *Shoulder Berm Gutter* and eliminated reinforcing steel.
- Removed plan views for curb details from the MicroStation file.
- Deleted dowel note.
- Removed ", at his option," from three notes concerning Contractor's option.
- Replaced "the concrete curb and barrier rail" with "the parapet and end post" from the note concerning sawed joints.
- Deleted note concerning Evazote Joint Seals payment.
- Partially filled in the Bill of Materials.

### *BAS2(SM): Bridge Approach Slab for Rigid Pavement with Barrier Rail*

- Added standard by modifying new BAS1(SM).
- Revised Standard No. at bottom of sheet.
- Revised to "Sheet 1 of 3" above title box.
- Showed a partial barrier rail in Sections Thru Slab. Additions include a construction joint and the bottom #5 (#16) 'B' bars in the rail.
- Revised top mat of 'A' bars to #5 (#16) bars and added two bars between existing bars shown as the top mat is now at 6" (150mm) spacing in Sections Thru Slab.
- For Section Thru Slab when not using reinforced bridge approach fills, revised to substitute 3<sup>rd</sup> note with subdrain note.
- Added three section views showing the reinforcing pattern in the rail.
- Added note at top concerning payment of barrier rail.
- Replaced "the parapet and end post" to "the barrier rail" from note concerning sawed joints.
- Partially filled in Bill of Material for One Approach Slab (2 req'd).
- Added Bar Types.

### *BAS3(SM): Bridge Approach Slab Details for Rigid Pavement with Barrier Rail*

- Added standard to include details specific to the guardrail attachment and barrier rail transition for rigid pavement.
- Plan views of barrier rail transition are included in the MicroStation file for appropriate skew conditions. Note that the end of the rail is squared off at the gutterline.

### *BAS4(SM): Bridge Approach Slab for Flexible Pavement*

- Made 2'-6" (750mm) dimension normal to the end bent.
- Asphalt surface was revised to extend to the gutterline.
- Added "Sheet 1 of 2" above title box.
- Added bar designations on Section Thru Slab (A1, A2, B1, B2).
- Section Thru Slab view from old BAS2(SM) for non-reinforced bridge approach fill was moved below the section view for reinforced bridge approach fill. Added direction to substitute 2<sup>nd</sup> note with subdrain note when not using reinforced bridge approach fills.
- Revised Section L-L for 8" x 4" curb without reinforcing steel and construction joint.
- Deleted Section M-M and Section L-L with Special Drainage.
- Revised transition length to 3'-1½" (953mm) for Detail at End of Curb without *Shoulder Berm Gutter* and eliminated reinforcing steel.
- Removed plan views for curb details from the MicroStation file.
- Combined notes concerning area between the wingwall.
- Deleted dowel note.
- Removed ", at his option," from three notes concerning the Contractor's option.
- Replaced "the concrete curb and barrier rail" with "the parapet and end post" from the note concerning sawing of the joint.
- Deleted note concerning payment of Evazote Joint Seals.
- Partially filled in the Bill of Materials.

### *BAS5(SM): Bridge Approach Slab for Flexible Pavement with Barrier Rail*

- Added standard by modifying new BAS4(SM).
- Revised Standard No. at bottom of sheet.
- Revised to "Sheet 1 of 3" above title box.
- Showed a partial barrier rail in Sections Thru Slab. Additions include a construction joint and the bottom #5 (#16) 'B' bars in the rail.
- Revised top mat of 'A' bars to #5 (#16) bars and added two bars between existing bars shown as the top mat is now at 6" (150mm) spacing in Sections Thru Slab.
- For Section Thru Slab when not using reinforced bridge approach fills, revised to substitute 3<sup>rd</sup> note with subdrain note.
- Added three section views showing the reinforcing pattern in the rail.
- Added note at top concerning payment of barrier rail.
- Replaced "the parapet and end post" to "the barrier rail" from note concerning sawed joints.
- Partially filled in Bill of Material for One Approach Slab (2 req'd).
- Added Bar Types.

*BAS6(SM): Bridge Approach Slab Details for Flexible Pavement with Barrier Rail*

- Added standard to include details specific to the guardrail attachment and barrier rail transition for flexible pavement.
- Plan views of barrier rail transition are included in the MicroStation file for appropriate skew conditions. Note that the end of the rail is squared off at the gutterline.

*BAS7(SM): Bridge Approach Slab for Prestressed Concrete Cored Slab*

- Made 1 ½" (38mm) joint dimension normal to the end bent.
- Added "Sheet 1 of 2" above title box.
- Added bar designations on Section Thru Slab (A1, A2, B1, B2).
- Revised Section Thru Curb to Section L-L for 8" x 4" curb without reinforcing steel and construction joint.
- Revised transition length to 3'-1½" (953mm) for Detail at End of Curb without *Shoulder Berm Gutter* and eliminated reinforcing steel.
- Removed plan views for curb details from the MicroStation file.
- Combined notes concerning area between the wingwall.
- Deleted dowel note.
- Removed ", at his option," from two notes concerning the Contractor's option.
- Partially filled in the Bill of Materials.

*BAS8(SM): Bridge Approach Slab for Prestressed Concrete Cored Slab with Barrier Rail*

- Added standard by modifying new BAS7(SM).
- Revised Standard No. at bottom of sheet.
- Revised to "Sheet 1 of 3" above title box.
- Showed a partial barrier rail in Section Thru Slab. Additions include a construction joint and the bottom #5 (#16) 'B' bars in the rail.
- Revised top mat of 'A' bars to #5 (#16) bars and added two bars between existing bars shown as the top mat is now at 6" (150mm) spacing in Section Thru Slab.
- Added three section views showing the reinforcing pattern in the rail.
- Added note at top concerning payment of barrier rail.
- Partially filled in Bill of Material for One Approach Slab (2 req'd).
- Added Bar Types.

*BAS9(SM): Bridge Approach Slab Details for Prestressed Concrete Cored Slab with Barrier Rail*

- Added standard to include details specific to the guardrail attachment and barrier rail transition for cored slab superstructures.
- Plan views of barrier rail transition are included in the MicroStation file for appropriate skew conditions. Note that the end of the rail is squared off at the gutterline.

*BAS10(SM): Bridge Approach Slab Details*

- Moved Section A-A and B-B off the standard.
- Revised or added plan or section views in the MicroStation file to accommodate either the 8" x 4" curb or the barrier rail for both sawed joints and armored joints.

## **BMR Standards**

In addition to specific changes listed below, the Standards were also renamed and reordered.

### *BMR1(SM): 1 Bar Metal Rail*

- Updated reference to "Rail Post Spacings and End of Rail Details" sheet.

### *BMR2: Rail Post Spacings and End of Rail Details for One or Two Bar Metal Rails*

- Added note about metal rail to end post connection containing the following.

### *BMR3(SM): 2 Bar Metal Rail*

- Updated reference to "Rail Post Spacings and End of Rail Details" sheet.
- Revised two notes to reference BMR2(SM).

### *BMR5(SM): 3 Bar Metal Rail*

- Old BMR6(SM).
- Revised to "Sheet 1 of 3".
- Updated reference to "Rail Post Spacings and End of Rail Details" sheet.
- Revised two notes to reference BMR7(SM).

### *BMR6(SM): 3 Bar Metal Rail*

- Old BMR7(SM).
- Revised to "Sheet 2 of 3".

### *BMR7(SM): 3 Bar Metal Rail*

- Old BMR8(SM).
- Revised Standard name.
- Revised to "Sheet 3 of 3".
- Moved Structural Concrete Insert details and notes from old BMR9(SM).
- Moved details slightly to accommodate Structural Concrete Insert details and notes.

### *BMR8(SM): Guardrail Anchorage Details for Metal Rails*

- Combined old BMR5(SM) and BMR9(SM) and deleted BMR9(SM).
- Revised Standard name.
- Added End View for 3 Bar and showed sidewalk.
- Made the End View of Guardrail Anchor Assembly Details generic by deleting parapet width. Bolt length for 3 bar added on user level.
- Remove parentheses from 3<sup>rd</sup> note.
- Deleted 4<sup>th</sup> note.
- Generalized the shifting of reinforcing in the 6<sup>th</sup> note.
- Move "\*\*Location of Guardrail Attachment" below sketch title.

## **Miscellaneous Standards**

### *CBR1(SM): Concrete Barrier Rail*

- Renamed "Barrier Rail – End of Rail Details" to "End of Rail Details for Adhesive Anchoring of Sawed Joints".
- Deleted Side View in End of Rail Details.
- Revised End View for bar designations, height dimension to 'S' bar, and no slope on top.
- Revised all three Plan Views in MicroStation file for bar designations and no slope at end.
- Removed modular joint details from MicroStation file.
- Removed bars S5 and S6 from the Bill of Material.
- Deleted S5 dimensions and removed "S3" from Bar Types.
- Revised "S3 thru S6" to "S3 and S4" in 4<sup>th</sup> note (two instances).
- Deleted last two notes.

### *GRA1(SM): Anchorage Details for Guardrail Anchor Assembly for Culverts*

- Renamed old GRA2(SM)
- Old GRA1(SM) was deleted as all details were incorporated on new BAS Detail Sheets.

### *PCS3(SM): 3'-0" X 1'-\_ " (914mm X \_mm) Prestressed Concrete Cored Slab Unit*

- Deleted Barrier Rail – End of Rail Details.
- Deleted S5 dimensions and removed "S4" from Bar Types.
- Preceded Epoxy Coated Reinforcing Steel with an asterisk in the Barrier Rail Bill of Material.
- Deleted three special provision notes.
- Deleted last note.